DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 62-63, 66-71, 79, 81, and 88 are rejected under 35 U.S.C. 102(b) as being anticipated by Peters et al. (US Patent no. 3,984,303).

With regard to claims 62 and 63, Peters discloses an electrolysis apparatus (col. 1, lines 61-62) including: an elongate generally tubular shaped outer electrode (14); an elongate generally tubular, shaped inner electrode (18), the inner electrode being positioned to extend generally longitudinally within the outer electrode (14; see figure1); and a separator (16) extending between the inner electrode and the outer electrodes (18 and 14, respectively; col. 4, lines 20-26), in which at least one of the inner and the outer electrodes (18, and 14, respectively) includes two generally tubular shaped formations formed from an electrically conductive mesh positioned one within the other, immediately adjacent each other (col. 3, lines 47-68; col. 4, lines 1-19), and each of which are of a foraminous (having an open area) electrically conductive construction (col. 3, lines 50-53; col. 4, lines 11-13).

With regard to claims 66 and 67, the two generally tubular shaped formations of the at least one of the inner and outer electrodes, as taught by Peters are coated with an electrically conductive material (col. 3, lines 46-50) in which the two generally tubular

shaped formations have been placed together and then coated with an electrically conductive material while in a placed together condition (col. 4, lines 3-10).

With regard to claim 68, the two generally tubular shaped formations, as disclosed by Peters, are coated with an electrical conductive material including nickel (col. 3, lines 47-50).

With regard to claim 69, Peters disclose in which the two generally tubular shaped formations of the at least one of the inner and outer electrodes (18 and 14, respectively) define a cathode of the electrolysis apparatus (col. 1, lines 61-68).

With regard to claim 70, Peters discloses wherein each of the inner and the outer electrodes (18 and 14, respectively) include two generally tubular shaped formations positioned one within the other, immediately adjacent each other (col. 1, lines 61-68; col. 2, lines 1-4), and each of the generally tubular shaped formations are of a foraminous electrically conductive construction (col. 3, lines 50-52; col. 4, lines 11-13).

With regard to claim 71, each of the two generally tubular shaped formations of each of the inner and outer electrodes, as taught by Peters, are formed from an electrically conductive mesh (col. 3, lines 47-68; col. 4, lines 1-19).

With regard to claims 79 and 81, Peters discloses an electrolysis apparatus (col. 1, lines 61-62) including: an elongate generally tubular shaped outer electrode (14); an elongate generally tubular shaped inner electrode (18), the inner electrode (18) being positioned to extend generally longitudinally within the outer electrode (14; see figure 1); and a separator (16) extending between the inner and the outer electrodes (18 and 14,

respectively; col. 4, lines 20-26), at least one of the inner and the outer electrodes (18 and 14, respectively) including a plurality of generally tubular shaped formations of a foraminous electrically conductive construction which are positioned one within the other, immediately adjacent each other (col. 3, lines 47-58), the generally tubular shaped formations having been coated with an electrically conductive material including nickel while in a placed together condition (col. 3, lines 47-50; col. 4, lines 3-10).

With regard to claim 88, Peters discloses an electrolysis method and apparatus (col. 1, lines 61-62) including: providing an electrolysis apparatus having an elongate generally tubular shaped outer electrode (14), an elongate generally tubular shaped inner electrode (18), the inner electrode being positioned to extend generally longitudinally within the outer electrode (14) and a separator (16) extending between the inner and the outer electrodes (18 and 14, respectively); exposing the inner and the outer electrodes to an electrolyte solution col. 3, lines 21-32); and establishing a potential difference between the inner and the outer electrodes (18 and 14, respectively) thereby to produce hydrogen by electrolysis (col. 5, lines 56-61), at least one of the inner and the outer electrodes (18 and 14, respectively) including at least two generally tubular shaped formations positioned one within the other, immediately adjacent each other (col. 3, lines 50-52; col. 4, lines 11-13), and each of the generally tubular shaped formations are of a foraminous electrically conductive construction (col. 3, lines 50-53; col. 4, lines 11-13).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 64, 65, 72-75, 80, 82-87 and 89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peters in view of de Nora et al. (US Patent no. 4,545,886).

With regard to claims 64, 65, 72-74, 80, Peters discloses all of the features as applied to claims 62, 70 and 79, above, but fails to teach wherein the two generally tubular shaped formations of the at least one of the inner and outer electrodes (18 and 14, respectively) are formed from a material including stainless steel or a conductive polymer. De Nora discloses a narrow gap electrolysis cell having an anode and a cathode compartment divided by an ionically-permeable separator (col. 1, lines 5-10) wherein the electrodes may be made of a material highly resistant to the electrolyte solution, such as stainless steel, graphite or any conductive polymer (col. 2, lines 30-32; col. 3, lines 13-14) in order to prevent corrosion of the metal surface in the environment in which the materials are to be used in the electrolysis cell. Therefore, one having

ordinary skill in the art at the time of the invention would have found it obvious to use electrodes made of a conductive polymer or a stainless steel material, as taught by de Nora, in the electrolysis apparatus of Peters, in order to prevent corrosion of the metal surface in the environment in which the materials are to be used in the electrolysis cell.

With regard to claim 75, Peters discloses wherein the one of the inner and the outer electrodes (18 and 14, respectively) which includes nickel defines a cathode of the electrolysis apparatus (col. 3, lines 47-50).

With regard to claims 82 and 83, Peters discloses an electrolysis method and apparatus (col. 1, lines 61-62) including: a tubular shaped outer electrode (14), an elongate generally tubular shaped inner electrode (18), and a separator (16) extending between the inner and the outer electrodes (18 and 14, respectively); each of the the two electrodes (14 and 18) are coated with an electrically conductive material (col. 3, lines 46-50) in which the two generally tubular shaped formations have been placed together and then coated with an electrically conductive material while in a placed together condition (col. 4, lines 3-10). However, Peters fails to teach wherein electrodes (18 and 14) are formed from a conductive polymer.

De Nora discloses a narrow gap electrolysis cell having an anode and a cathode compartment divided by an ionically-permeable separator (col. 1, lines 5-10) wherein the electrodes may be made of a material highly resistant to the electrolyte solution, such as stainless steel, graphite or any conductive polymer (col. 2, lines 30-32; col. 3, lines 13-14) in order to prevent corrosion of the metal surface in the environment in which the materials are to be used in the electrolysis cell. Therefore, one having

ordinary skill in the art at the time of the invention would have found it obvious to use electrodes made of a conductive polymer or a stainless steel material, as taught by de Nora, in the electrolysis apparatus of Peters, in order to prevent corrosion of the metal surface in the environment in which the materials are to be used in the electrolysis cell.

With regard to claim 84, Peters discloses wherein the conductive material includes nickel (col. 3, lines 47-50).

With regard to claim 85, Peters discloses an electrolysis apparatus (col. 1, lines 61-62) in which one of the at least two electrodes (14 and 18; see figure 1) is in the form of an elongate generally tubular shaped outer electrode (14; col. 1, lines 61-67) and the other of the at least two electrodes is in the form of an elongate generally tubular shaped inner electrode (18), the inner electrode (18) being positioned to extend generally longitudinally within the outer electrode (14, as shown in figure 1), the separator (16) extending between the inner and the outer electrode (18 and 14, respectively; col. 2, lines 2-4).

With regard to claim 86, Peters further teaches wherein at least one of the inner and the outer electrodes (18 and 14, respectively) is foraminous (col. 3, lines 50-52; col. 4, lines 11-13).

With regard to claim 87, Peters teaches an electrolytic cell in which the electrodes (14 and 18) define a closed off end (col. 2, lines 42-44; col. 3, lines 21-33; col. 4, lines 32-40).

With regard to claim 89, Peters discloses all of the method steps, as applied to claim 88 above, but fails to teach exposing the inner and the outer electrodes (18 and

14, respectively) to an acidic electrolyte solution. However, it is well known in the art to use an electrolyte comprising an acidic solution in an electrolysis cell in order to obtain the desired products, as exemplified by de Nora. De Nora teaches an electrolysis of water, either acid or alkaline, to produce hydrogen and oxygen and the electrolysis of hydrochloric acid to produce hydrogen and chlorine, among others (col. 11, lines 48-55). In the instant application, a potential difference is established between the electrodes in order to produce hydrogen by electrolysis. Both Peters and de Nora teach generating hydrogen by an electrolytic reaction. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use an acidic solution comprising acid water, or hydrochloric acid, in the electrolysis process, as taught by de Nora, in the process of Peters in order to obtain the desired product, such as hydrogen.

6. Claims 76-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peters, as applied to claim 62 above, in view of Gruber (US Patent no. 3,260,620).

With regard to claims 76-78, Peters discloses all of the features, as applied to claim 62 above, but fails to teach wherein the separator (16) includes a wettable fibrous material, such as cellulose. Gruber discloses fuel cell comprising a separator (51) between the electrodes (12 and 13) wherein the materials used for the separator may include cellulose materials or felted sheets of cellulose fibers (col. 10, lines 3-39) because of its resistance to heat and chemicals. The cellulose can also be regenerated from cellulose acetate to provide materials which are highly wettable as well as resistant to chemical attack (col. 10, lines 24-27). Therefore, one having ordinary skill in the art at

the time of the invention would have found it obvious to use a separator made of wettable fibrous material, such as cellulose, as taught by Gruber, in the apparatus or Peters, in order to protect the membrane against the electrolytic conditions due to the cellulose resistance of heat and chemical attack.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ZULMARIAM MENDEZ whose telephone number is (571)272-9805. The examiner can normally be reached on Monday-Thursday, 8:30am-5:00pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Z. M./
Examiner, Art Unit 1795

/Alexa D. Neckel/
Supervisory Patent Examiner, Art Unit 1795